

Structural Monitoring System (SMS) and Visual System (VS)

Challenge

The Oak Ridge National Laboratory (ORNL) has many buildings that are in surveillance and maintenance mode while awaiting deactivation and decommissioning (D&D). During this time, entry for inspection is periodic with entry requirements based on previous knowledge of facility conditions. However, entry requirements and access safety can change due to deteriorating conditions such as collapsed or collapsing ceilings, structures, ductwork, etc, which can spread radiological, chemical, or asbestos contamination. Buildings 3026 and 2000 are two such buildings out of many at ORNL.

Tech Solution

Axis Communications, Inc. has developed network ready, environmentally tolerant, low-light level camera-visual systems (VS) with built-in pan and tilt mechanisms that permit remote monitoring of facilities that are in standby mode. The video is remote delivered via network connections to the office computers of staff members responsible for monitoring the facility where they may not only view video but also pan, tilt the view and zoom in on objects of interest. Access is restricted to authorized staff only.

In addition, Laser-View Technologies, Inc. has developed a networkable laser measurement system able to transmit information to a remote computer. This system is packaged to provide a remote structural monitoring system (SMS) to target objects of interest for monitoring structure movement. The DIMETIX DLS-B 30 laser has a better than 2-mm resolution when used at ranges typically encountered in buildings.

Facilities in standby mode normally have had electrical power turned off for fire protection reasons. All the standard electrical wall outlets are unusable; therefore, power must come from outside the facility. As a result, low voltage, fire protection safety approved temporary power (24 V AC and 24 V DC) circuits were installed in the building to be monitored. This allowed around the clock operation of the camera and laser sensor.

Each system also required hard-wired Ethernet connections to the site network for operation. While it can be technically tedious to route network connections to a disconnected facility in standby mode, the solution is straightforward. While wireless Ethernet was considered, site network security restrictions eliminated this option.

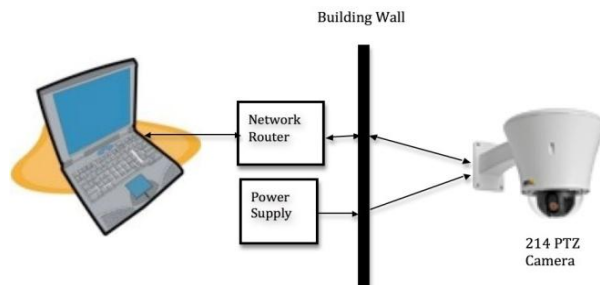


Figure 1: A schematic of the visualization system (VS) connection.

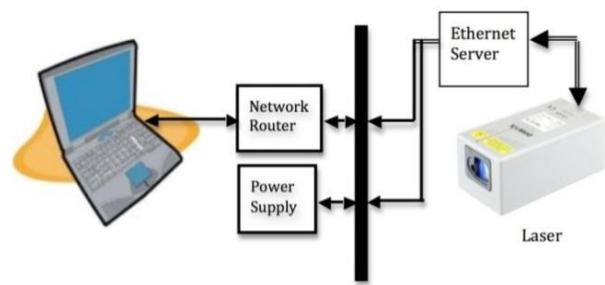


Figure 2: A schematic of the structural monitoring system (SMS) connection.

Site Project & Identifier

D&D Toolbox – ORNL D&D of Buildings 3026 and 2000

Tech Stage: Demonstration and Deployment

Demonstration in Building 3026 and Deployment in Building 2000

Tech Accomplishments

Both systems were installed in Building 3026 near the hot cell manipulator area. The Visual System (VS) was mounted on a vertical building beam in the area of interest. It was used to monitor conditions in the building before periodic entry for inspection to certify that physical conditions (deterioration) that might impact entry requirements had not changed. The Structural Monitoring System (SMS) laser sensor was mounted on a custom stand designed to keep it off a floor that was frequently inundated with rainwater. The SMS was targeted at the ceiling, waiting final positioning on the structural beam of concern before it had to be removed due to heavy floor traffic in the area.

Since Building 3026 has been turned over to contractors for decommissioning, the VS camera system was re-deployed into Building 2000 for longer term use in visual monitoring of the facility's hazardous conditions. Also, because the SMS had to be removed, it was not located in Building 3026 long enough to note any changes in facility structural status. The system was also re-deployed into Building 2000 for longer term use where it will be used to monitor sagging contaminated ductwork that also contains asbestos.

Impact

The camera system provided a good view of the areas where entry was required and where work was being carried out. It was also able to observe structures in the building that were degrading without having to physically enter the building. Lab testing of the SMS laser sensor indicated that it could provide long-term monitoring for structural deflection by measuring resolutions on the order of 1 mm. This would identify not only falling pieces such as ceiling tiles but would also monitor structural beams for changes in integrity due to sagging. The ability to remotely view degrading structures provides D&D operators with a valuable tool to note changing conditions and to assess the safety of facility access.

Impacts and Features

Structural Monitoring System

- Provides laser based surveillance of facility structures and components so that there are no surprises during routine building entries—e.g., falling ceiling panels, sagging floor beams, falling ductwork—providing worker/environment risk reduction
- Provides portable deflection measurements of components and structures in a monitored facility

Visual System

- Provides video surveillance of facility conditions so that there are no surprises during routine building entries—e.g. falling ceiling panels, sagging floor beams, falling ductwork—providing worker/environment risk reduction
- Requires temporary low voltage power (fire safety approved) and hard-wired (or wireless if permitted) Ethernet connections in the facility
- Images/signals are available 24/7 to authorized staff at their office computers
- Low cost implementation (< \$6,000)

Vendor Information Axis Communications
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Technology Name

- Axis214 PTZ network camera
- DIMETIX DLS-B 30 laser

Federal End User Information James D. Kopotic
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Tech User Information TBD

Web Links <http://www.axis.com/index.htm>
<http://www.laser-view.com>

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Challenge Category	Tech Solution Category
<ul style="list-style-type: none">• Surveillance and Maintenance• Facility Stabilization	<ul style="list-style-type: none">• Surveillance and Maintenance